TOOL DIE MACHINE
PROGRESS
THE NATIONAL TOOL AND DIE JOURNAL

TOOLS, DIES, JIGS, FIXTURES
MOULDS, GAGES, MACHINES
Design and Engineering
PRECISION SPECIALTIES
STAMPING and PARTS PRODUCTION
Official Publication
Special Tool, Die & Machine Shop Industry

APRIL, 1938

Circulation more than 10,000

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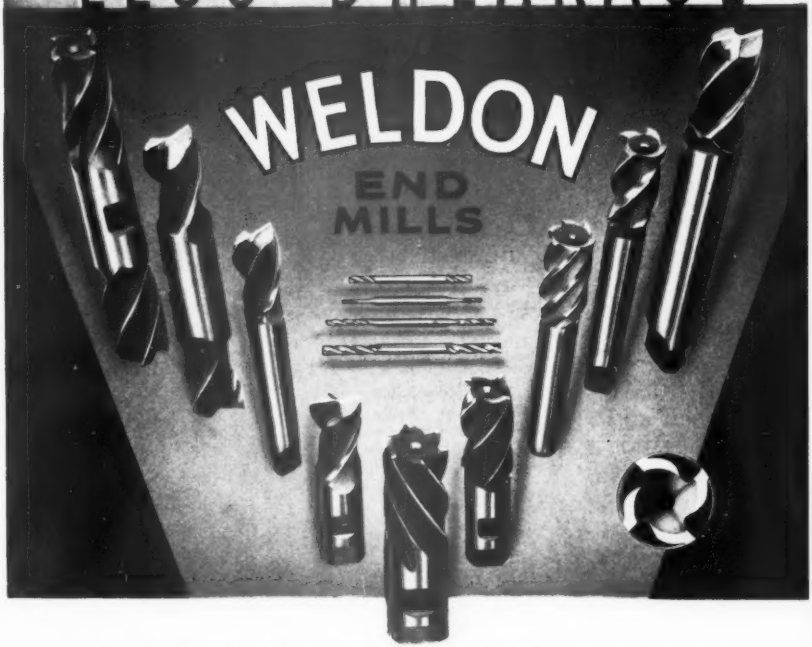

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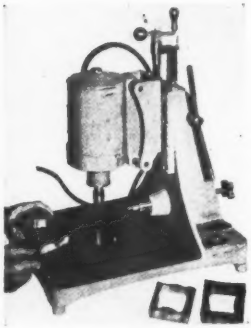

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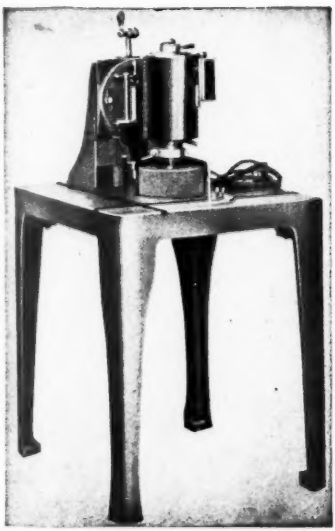

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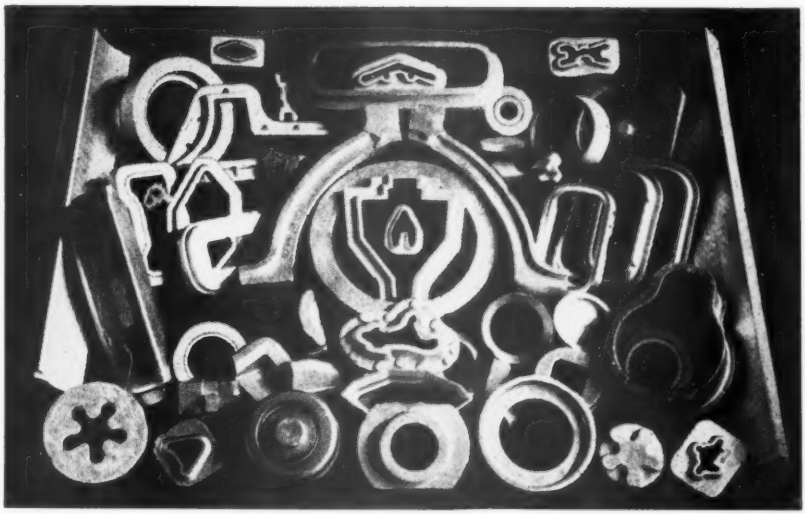

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GEORGE J. HUEBNER . . . *Publisher and Editor*
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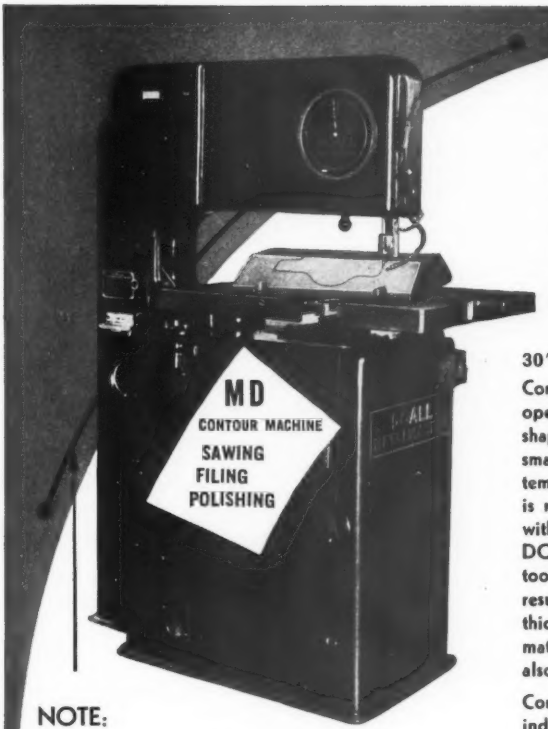

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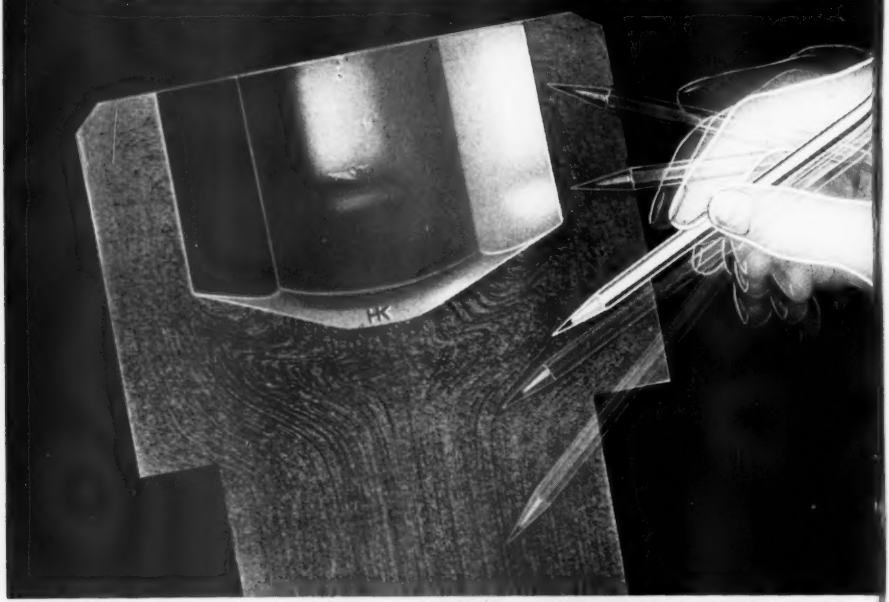

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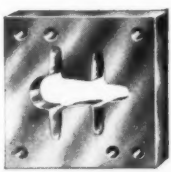

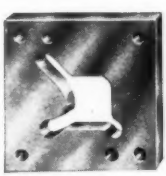

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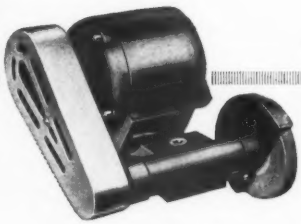
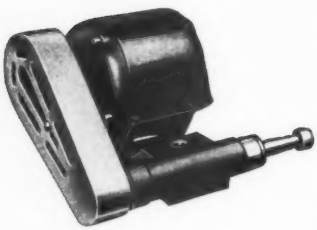


For external grinding



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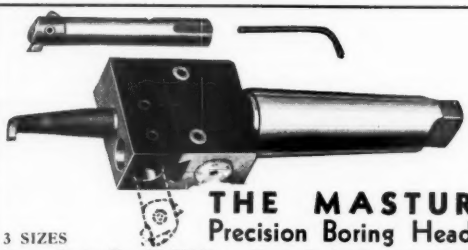

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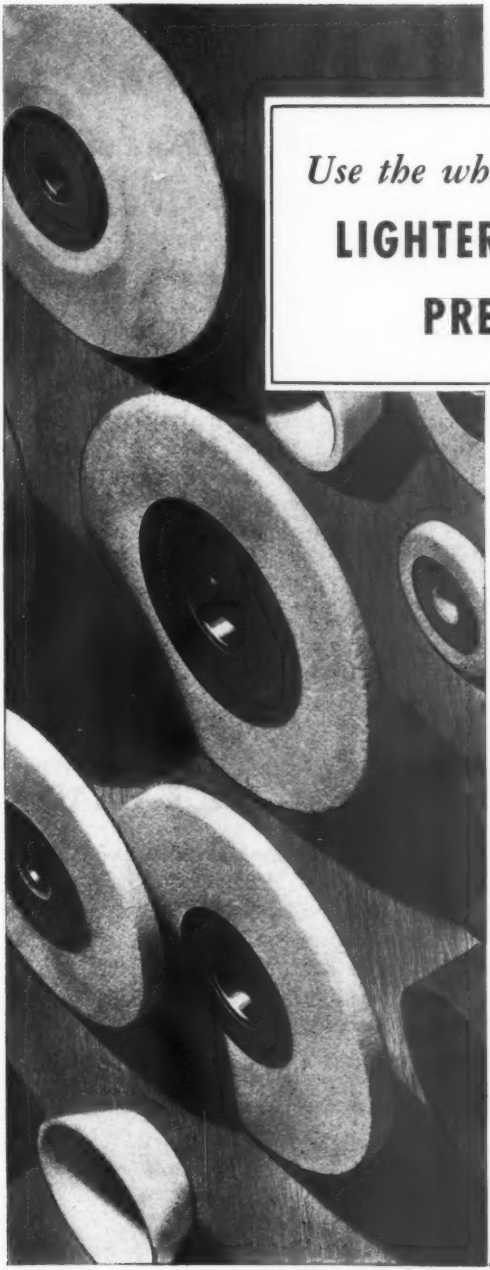

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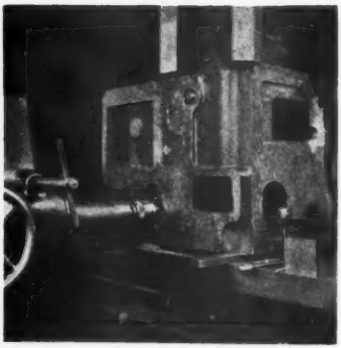

Consider Your Horizontal Boring Mill!

Here is a typical Horizontal Boring Mill job calling for speed and accuracy. The machine is a 5″ bar Lucas, the tool equipment a Precision Universal Tool Head with No. 5 Morse shank. Body and shank are one integral chrome nickel steel forging, hardened and ground, giving ruggedness and stamina to take ¾″ of metal out of a 6″ hole at one pass. Precision construction gives instant adjustability to "tenths" for finishing cuts. This one Tool Head handles all holes from 1/16″ to 16″ diameter. Recessing, back-facing and undercutting operations not visible in illustration performed at same time without any special tooling or lost time. The Precision Universal Tool Head has been adopted by the following manufacturers of Horizontal Boring Mills in their own plants and is recommended by them as preferred adjustable tool equipment for their machines: Lucas Machine Tool Co., Gidding & Lewis Machine Tool Co., Wm. Sellers & Co. and Universal Boring Machine Co.

THE PRECISION UNIVERSAL TOOL HEAD

This outstanding tool brings all adjustments under absolute micrometric control of the operator at all times and all speeds WITHOUT STOPPING TOOL OR MACHINE. It is the fastest and most accurate boring tool in existence. But in addition to that, it also faces, counterbores, turns outside diameters, mills flat surfaces and slots, undercuts, recesses, back-faces, trepans and does an almost limitless range of "headache" jobs that are utterly impossible with wrench-adjusted "offset" boring heads because such older types of tools cannot be cross-fed or adjusted while running.

One size Precision Universal Tool Head bores all holes from 1/16″ to 16″ diameter and will pass through any hole where a 4″ bar will follow. Unsurpassed for internal threading.

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Tool • Die • Machine **PROGRESS**

The National Tool and Die Journal

April, 1938 Vol. 4, No. 1

Times Change — Or Do They?

The Situation From a Tool Steel Maker's Point of View

◆ ◆ ◆

By ARTHUR T. CLARAGE, President
Columbia Tool Steel Company
Chicago Heights, Illinois

◆ ◆ ◆

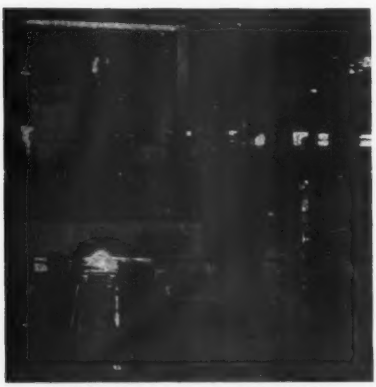
SIX months ago we were all worried about getting skilled men, enough production, possible interruption in manufacture and both the availability and advancing prices of raw materials. Most steel manufacturers and their customers, including users of tool steel, bought too far ahead in the face of later developments. These advance purchases were for very real reasons and some of them are still potential problems. Prices are now off somewhat but with the maintenance of wage levels and added tax burdens and further government deficits, it would appear that some of us may regret that we did not actually have more inventory ahead.

From the tool steel maker's point of view, it would seem that world disorganization and uncertainty and inflationary tendencies are checking what might otherwise be a buyer's market. Many tool steel users' inventories are a source of pain at the moment. There can be no denying that it is wise to give attention to working off the overbalanced items. However, there is much to recommend that a manufacturer continue to buy in the largest possible quantities and carry an adequate stock of tool steel. What is more important, he should see that his standard tools, dies and manufacturing equipment are in good order. The manufacturer who can get and keep in good order and make changes and improvements at this time is indeed fortunate. There seems to be a hesitancy about "made work" programs at this time that many used following 1929. We should not forget that there were no audible complaints during 1935, 1936 or 1937, expressing regret about these previous "made work" undertakings. Every manufacturer must decide for himself how much inventory and tooling are justified, but certainly everything should be done that can be done in the ordinary course of business and special efforts are worthy of consideration.

In addition to getting and keeping tools and equipment in shape, some can take advantage of the present opportunity to change the details of methods or the methods themselves to obtain better per-

Taking sample for alloy analysis during melting process.

Pouring molten tool steel into ladle.



Filling ingot mold from ladle.

formance. Re-design and new methods should at least be given thought at this time.

The list of tool steels offered was never more complete and the methods of manufacture have been brought up to new high standards, assuring perfection and uniformity. A long list of standard steels is available. The largest number of "variations" or slightly modified steels for varied requirements that has ever been on the market is now offered. The standard high speed steel (tungsten 18%, chromium 4%, vanadium 1¼%) is used today for a larger proportion of dies and die parts for both hot and cold work than ever before. In addition, the increased vanadium high speed steel (tungsten 18%, chromium 4%, vanadium 2%) has come in for a share of the more abrasive work. High carbon, high chromium "super die" steels (carbon 2% and over, chromium 10% and various alloys) are finding surprising demands in the face of the common thought that short runs only are required. Standard and varied oil hardening types enjoy their share of popularity.

New attention has been directed to some of the strong, tough, impact resistant steels. The steel that was originally intended for alloy punches and chisels (carbon .50, tungsten 2.25, chromium 1.20, vanadium .25) is finding increased use in shearing tools and dies, as well as in the hot and cold forming operations. The carbon tool steels were never better and are now practically non-deforming in hardening. Many other steels than these mentioned offer new and valuable possibilities.

Attention to tools at the present time is not only desirable but the services of experienced tool steel manufacturers' field men and technical talent are now more readily available for assistance. Tool steel makers are not only eager to help in the present situation, but are anxious to show what can be done with their modern materials which are now made in clean, well lighted mills with the best of equipment and control and testing devices.

The progressive tool steel manufacturer has before him literally thousands of recent triumphs in blanking, forming, shaving, crimping, coining, trimming and many other operations. These performances are in fabricating the new mate-

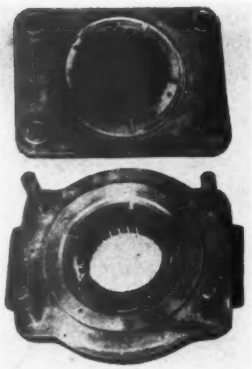
rials and old materials for new purposes that are now with us. New heat treating technique by changed manipulation or with new or rebuilt equipment will be explained and worked out for the asking.

The manufacturer or tool and die maker today who can make improvements and plans for the future is surely for-

Hammer working tool steel ingot.

tunate. If we can judge by the past, well directed efforts to make improvements today will pay real future dividends. These can add increased efficiency, new standards of quality, added capacity, adaptability and freedom from trouble in future times when experienced men are too busy to give such items attention. Unless men are to be born skilled in the future or there is no future ahead for America, this should prove the best possible program.

Rolling tool steel billet into finished bar.



Over 20,000,000 blanks from this super die steel.

Times may have changed but there is something similar to the past in all this and, rather than bemoan our present situation, the present opportunity should be used to secure further improvement in the future.

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Design for Isolation

Recently one of the factors which determined that a manufacturer of forgings must move his plant was the effect of the vibration of his drop-hammers upon other buildings and their contents in the vicinity.

The precision standards of modern manufacture require not only perfect machine and tool functioning but also machine insulation against accuracy-disturbing vibrations. Inspection of precision work is frequently jeopardized by the proximity of production equipment which affects accurate measuring. There is also a continually increasing demand for the elimination of noise with its disturbing and wearing effect upon workers.

The interest created by the article "Rubber Scores Another Victory Over Vibration," written for us a few months ago by T. S. Rowe of the engineering department of the B. F. Goodrich Company, actuates us now to reproduce this timely article from the Industrial Bulletin of Arthur D. Little, Inc.

—The Editor

◆ ◆ ◆

THE tendency toward increased speed of machinery has resulted in vibration and noise problems that often reach the "nuisance" or "damage" level. It becomes of importance to isolate such machinery from the floor structure to reduce the noise and vibration transmitted. A completely balanced drop-hammer, loom, or automatic machine has not yet been designed, and thus isolation materials become engineering necessities.

Some vibration may be overcome by tightly bolting the offending mechanism to an extremely heavy rigid object. However, such attempts may prove disastrous, for a heavy printing press bolted to a concrete floor may endanger the whole building. A usual solution is to use resilient mountings which permit the machine to vibrate freely with respect to the foundation. A simple vibration insulation is a set of inflated bicycle tires inserted underneath the offending machine.

Familiarity with the physical principles involved has contributed to the development of important new materials being used more and more in vibration isolation and sound deadening. Of these, prominent in the rubber field are rubber-metal combinations like two-decker sandwiches, in which metal is bonded to both sides of a resilient rubber slab. Many different forms of rubber mounting of this type are now found in the vibration isolation of heavy mill machinery, electric motors and generators, and small marine power plants, and are used extensively in the floating engine supports of American passenger automobiles. The fundamental type of such mountings is a "shear sandwich" made by bonding three parallel pieces of sheet steel to the two rubber slab sections which separate them like a sandwich filling. The load is usually hung on the central plate, while the outside plates connect to the supporting structure; this subjects the rubber slabs to a shearing stress. The shear type of mounting is most common for rubber, although rubber may be placed in compression just as cork and felt are normally loaded.

In designing for isolation, careful study must first be made of frequencies present which need to be isolated, and several methods are available for doing this with speed and facility. The natural frequency of the machine on its isolation,

according to standard principles, should be far less than the operating vibration frequency of the machine alone. This makes it possible to predict and specify the number and type of mountings which will be best. Special rubber mountings have been designed for noise insulation, where the vibrations are of small amplitude and extremely high frequency. "Permacell" slabs of cellular compressible rubber are used as absorbents of shock and small amplitude vibrations. Slabs of this material may be used to "float" whole floor sections in machine shops bearing heavy machinery. In one installation where an 8000 pound planer and a 40,000 pound concrete slab supporting it are floating on Permacell slabs, no noticeable shock is transmitted to the building even at the instant when the planer table reverses its motion. Other new materials used in compression type mountings include the synthetic material "Vibracork," a product composed of granules of pure cork compressed and baked with its natural binder under pressure like a synthetic plastic. In certain applications oil-resistant mounting pads are needed, and for these a new composition of cork and synthetic rubber, "Corprene," in various densities, has been found satisfactory. Felt manufacturers have lately been able to produce felt pads of variable stiffness, suitable for mounting both light and extremely heavy machinery.

In transportation, both rubber and rubber-cork products are being increasingly used to absorb machinery vibrations. In the Electric Railway Presidents' Conference rapid transit street car, the latest answer to the challenge of the bus, the wheels incorporate rubber between the hubs and tires to reduce noise and absorb vibration, and the truck springs are also made of rubber bonded to steel members. In recent streamlined trains, special rubber isolation materials have gone into trucks, brake rod supports, and vestibule connections.

Many of the unanticipated problems of noise, vibration and sway, which appeared with the more radical designs of cars, trains and high-speed machinery, are still under active investigation. An expanding use of specially developed vibration-eliminating materials and methods seems indicated as such investigations continue.

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Hard Chrome Plating, a Solution for Many Problems of Undue Wear

◆ ◆ ◆

By A. R. ABEEL, President
Master Chrome Service, Inc.,
Division of Master Tool Co., Inc.

◆ ◆ ◆

CHROMIUM as an ore has been known for more than 150 years. Its primary use until about 1920 was as an ingredient of blue pigment. Then began experimentation to determine the possibilities of broader commercial use.

In 1925 electro-plating hard chromium onto the surfaces of certain metals became an industrial business. Although chromium is one of the hardest substances known to science—only the diamond is harder—chrome plating as a surface finish is a quite simple process, and should not be confused with hard chrome deposited directly on the metal for wear or corrosion.

This extreme hardness of chrome—Moh's scales rate it at 9, the diamond at 10—naturally tends to give it remarkable resistance to corrosion and erosion, making it superior for electro-plating wherever it comes in contact with moisture, salt water, alkalis and most acids but this same hardness also assures unusual resistance to abrasion and in a comparison with other structural metals the following table of the coefficients of friction will be found interesting.

METALS	STATIC	SLIDING
Chromium plated steel on chromium plated steel	.14	.12
Babbitt on chromium plated steel	.15	.13
Steel on chromium plated steel	.17	.16
Steel on babbitt	.25	.20
Babbitt on babbitt	.54	.19
Steel on steel	.30	.20

This tendency of hard chrome to resist wear, even more recently has brought it into use for prolonging the wear-life of machine parts, tools and dies. This process is considerably different from chrome plating for surface finish only, inasmuch as it requires the application of from 1/1000 to ⅛ inch of chromium. Although chromium plate adheres readily to base metals it required no little experimentation to develop this process and among organizations contributing to its success is The Master Tool Company which was the first to apply hard chrome to pneumatic tools. Phillip P. Hale, a mechanical engineer and a member of this organization, should be given much of the credit for developing the scientific process of depositing chromium. Today thousands of new machine parts and tools are being plated to insure a minimum of wear and worn tools are being reconditioned so that they may go back into service.

The use of chromium on cutting edges of small tools is not as a rule advisable but there are many instances in particular operations where it really solves a severe production problem. An example is the reaming of a deep hole in cast iron where it has been found necessary to use a solid reamer 1½" in diameter with flutes 6" long and a tolerance of only .0005" is allowed. It will be readily realized that after very slight wear this expensive solid reamer would no longer be usable. However, by grinding the reamer originally .0004" under size and then plating it with a thickness of .0002" of hard chrome without sharpening it afterwards, it was found that it would ream six times as many pieces.

There are instances where the life of

Fig. 1. *This burnishing broach is used for reaming brass bushings after they have been pressed into steering knuckles. Chrome plating eliminates "sticking" and "pick up" and prolongs life of wearing surface.*

drills used on a composition of rubber and bakelite was prolonged eight times by applying .0001" of chrome on the lands; the application of from .0001" to .0002" chrome on a new tap which is being used on soft metal will overcome difficulty experienced on pick-up or finish, and the same treatment prolonged the life of slitting saws used on copper or for deep slot milling.

An outstanding example of the use of hard chrome plating is in the printing industry where the life of plates has been increased as much as 500%.

Pumps of various kinds which are expected to withstand severe usage are assured much longer life when wearing parts are chromium plated. Other items with which unusual success has been attained are

Piston rods for gas, oil and steam engines
Piston rods for locomotives, pumps, compressors
Crankshafts
Cams
Machine tool lead screws
Table rolls for paper mills
Rollers for roll type suction boxes
Textile printing rollers
Hosiery knitting needles
Equipment for rayon mills, doling sleeves, falle wires, drop wires, tensions and guides
Pneumatic tools
Electrical porcelain dies
Dies for drawing brass, copper, steel, wire and for stamping out sheet metal parts
Glass bottle moulds
Hot forging dies
Thread gauges
Electrotypes

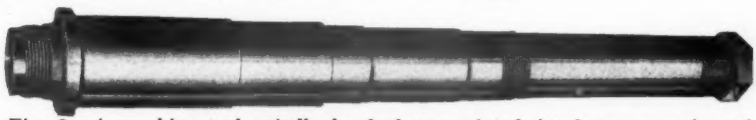


Fig. 2. *A machine tool spindle hard chrome plated for longer wearing of bearings. Main bearings were plated .025" and pilot .015" which prolongs spindle life several times beyond an unplated one.*

Meter parts, gears
Canning machinery parts and other parts to resist wear and corrosion.

It can well be said that new uses of chrome plating for longer wear are being developed almost daily.

Chromium is invaluable when inspection reveals that a product part, tool, die or machine part has been machined undersize or oversize. An excellent example of this is the pump chamber illustrated

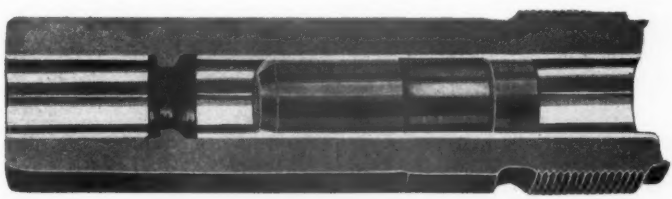


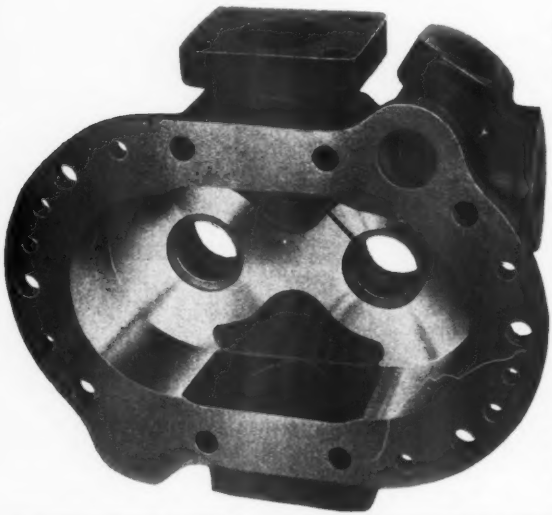
Fig. 3. *This chipping hammer cylinder was worn .018" oversize and restored to standard measurement with hard chrome plating. It should not again show such an amount of wear in many years of service.*

in Fig. 5 which was machined oversize. The difficulty was readily overcome by plating with .012" thickness of hard chromium thus saving an expensive part, as well as prolonging its life.

When hard chromium plating fails it may be said to be almost invariably due to improper processing, perhaps because of lack of fundamental knowledge, or perhaps more frequently of lack of experience. Hard chromium plating of intricate tools and products for longer life really involves engineering and this is also true of reconditioning with chromium.

There has been great growth in the past few years of companies who make a specialty of hard chrome and who are combining mechanical features with the plating, thereby controlling it definitely.

Fig. 4. *A chrome plated rotor cylinder.*



While chrome has been more or less expensive in the past the development of modern production methods, especially on quantities, has brought the cost within a reasonable range for almost any purpose.

Fig. 5. *This pump chamber was machined oversize in error. Plating it with hard chrome of a thickness .012" made it possible to use an expensive part and will also result in longer use-life.*

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Flame Hardening of Lathe Beds to Insure Longer Wear

IN the mechanical laboratory of the modern plant in which Monarch lathes are built, an interesting test has been under way for several weeks. It is being conducted to determine just how much better the new "Flame Hardened" lathe bed is than the unhardened type.

Herewith is the reproduction of a photograph showing two 12" lathe beds. The one on the left is not "Flame Hardened" and tests a Brinell hardness of 240; the one on the right is the same size and has the way surfaces "Flame Hardened" to 590 Brinell.

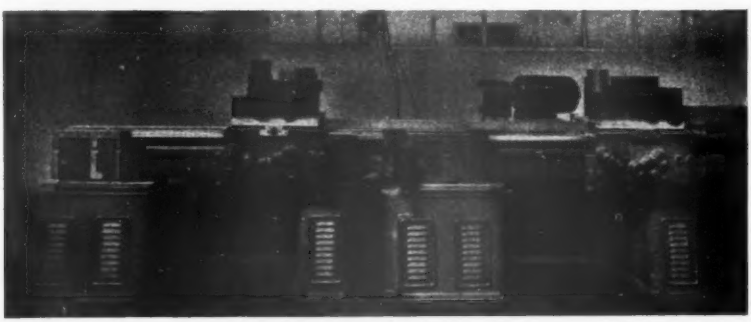
A carriage with a load of 500 pounds of steel is mounted on each lathe bed. An electric motor through a crank arrangement simultaneously moves the carriages one foot of travel in each direction. Both carriages have automatic 4-speed lubrication to the bed ways and are equipped with Duprene way wipers. Fine chips and abrasives are deposited at frequent intervals on the ways of each bed. Thus test conditions for both lathe beds are identical.

It is estimated that each carriage traverses its bed 28,800 times in each 24 hours which undoubtedly subjects it to many times more wear than a lathe would be required to withstand from regular usage.

In the process of "Flame Hardening" as developed by Monarch, the entire "V" and "flat-way" portions of the lathe bed are hardened to a uniform depth of ⅛" or more. After finish planing, the way surfaces are hardened, then ground with extreme accuracy to where they have the appearance of hardened steel. Grain structure of the hardened portions is refined and condensed while the metal directly under such hardened sections becomes dense and close grained, averaging about 220 Brinell and assuring the required support for the hardened sections.

It is claimed for this method of "Flame Hardening" way surfaces that the bed section is not weakened as it may be when planing is done to receive hardened

(Continued on page 35)



New Counterbore Has Continuous Pilot Head

A NEW counterbore has been designed which utilizes a greater length of the flutes before it is necessary to discard the tool.

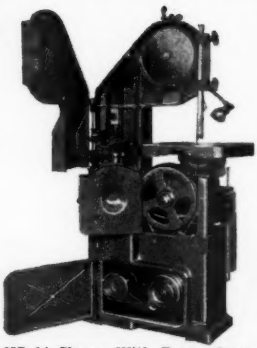
A pilot is continuous through the entire fluted portion of the tool so that when the pilot head becomes too long, as the result of wearing of the cutter flutes, it is cut off. The flutes are ground back to the length of a pilot head, and thus a new pilot head is exposed. This operation may be repeated as many as six times and each change in length produces a counterbore that is as efficient in every way as the original tool.

This new counterbore, known as the Putnam Hi-Speed Continuous Pilot Counterbore is made of high-speed steel, is heat-treated by the salt bath process, and is unconditionally guaranteed for perfect performance. For complete information, write The Putnam Tool Company, 2985 Charlevoix, Detroit, Michigan, for Catalog TD.

MODERN DIE-MAKING MACHINES

YOU'LL BE INTERESTED IN THIS IMPROVED GROB METAL BAND SAW

Model NS 14



NS 14 Shown With Doors Open

Improved in efficiency and performance, this new Metal Band Saw has an overflowing measure of new refinements and operating features . . . scientifically designed saw guides assuring faster cutting and longer life to the saw blade, four way tilt table, five speeds, automatic table feed with oil dash pot, etc. . . . improvements that will mean perfect dies at lower costs. No matter what your die problems may be, this Metal Band Saw is the answer. Write for detailed catalog.

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PRECISION PAYS

An unusual industrial occurrence perhaps, but an important one in which all dies on production runs were remounted in Danly Precision Sets.

In modern high-speed production, precision pays and Danly Precision Die Sets are money makers on the press line—in their freedom from shearing and the consequent need for regrinding, and the guarantee against production line tie-ups and die destruction.

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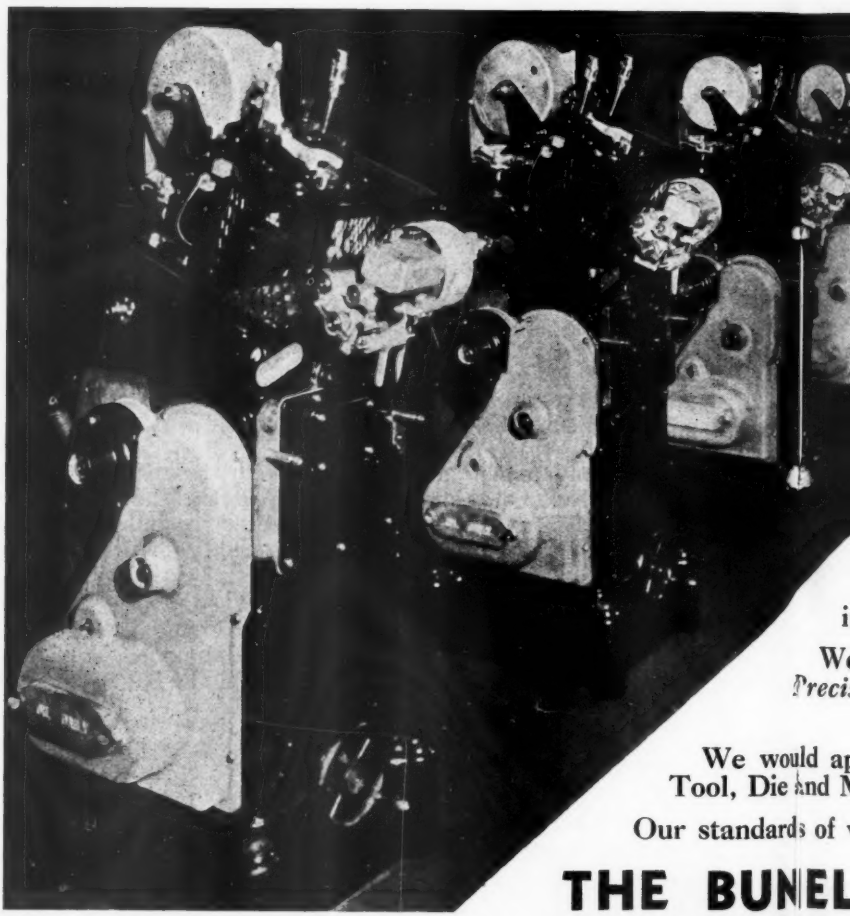

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Die Designing and Estimating

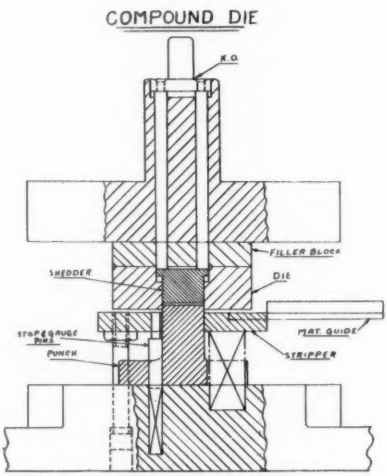
By CHARLES BOHMER

This fourth article continues the series on "Tool Designing and Estimating" as this subject is being taught to Tool and Die Shop apprentices under the auspices of the Chicago District of the Tool·Die·Machine Shop Institute in the Carl Schurz High School. The author, Charles Bohmer, tool superintendent of the Federal Tool Corporation, is one of the class instructors.

Simple Compound Blanking Dies

COMPOUND blanking dies are used extensively when flat blanks are required or when the blanks are too large for the drop-through construction. They differ mainly in the mounting and blank ejection insofar as the die is mounted on the punch holder and cleared of the blank by means of a shedder and knock-out arrangement.

The component parts of a compound die are the die block, punch, stripper, shedder, knock-out, gauge pins and stop.



DIE BLOCK

All general principles of construction such as thickness, quality of tool steel, sectional parts, correct opening size and contour, are brought into use. However, there is no draft or taper. In some cases, a recess or step is machined into the rear of the block for shedder retainment.

PUNCH

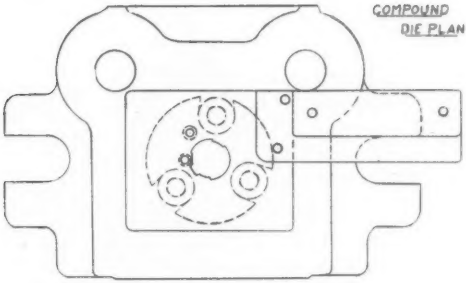
Here, as in the die block, all general principles of construction are closely followed with the addition of provisions for spring pockets or recesses for the stripper and spring gauge and stop pins when the punch is of the base type.

STRIPPER

Spring strippers are always used, fitted properly and fastened securely with shoulder screws or plain screws and jam nuts, with springs equally distributed and of such strength as is necessary to strip the scrap from the punch—usually from five to ten per cent of the blanking pressure. The thickness and quality of material varies according to the severeness of the operation and may be left soft or hardened. Precaution must be taken to provide adequate movement of the stripper with reference to spring and screw travel.

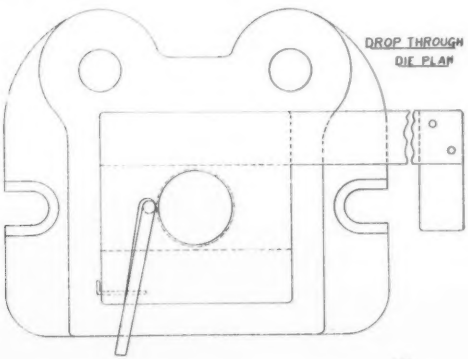
SHEDDER

Two types of shedders are used—the shouldered or straight, depending upon the size of blank. In small dies, the shedder, usually of tool steel and hardened, is of the shoulder or flange construction. It is machined and finished to



a slip fit in the die opening and retained or prevented from dropping out by the flange. The length of the shedder from the top surface to the shoulder should not be less than $\frac{1}{64}$ of an inch longer than the thickness of the die opening—that is, the distance from the surface to the recess or undercut. This is necessary in obtaining proper blank ejection. A spring stripper pin must always be inserted to prevent the blank from adhering to the shedder surface because of oil or other substances.

The plain or straight shedder is used in large dies where the shoulder construction would be impractical. It is, in most cases, either of cold rolled or machine steel machined to a slip fit in the die opening and held in position by shoulder screws. If the die is of medium size where a knock-out arrangement can be used, ejection is accomplished in this manner. However, if the die is very large, ejection is performed by means of springs inserted under the shedder. Here again precaution must be taken to provide enough travel in both screws and springs.



KNOCK-OUT

The purpose of the knock-out is to actuate the shedder in ejecting the blank. Various types are used depending upon the shape and size of blank and pressure required for the ejection. In all cases, the knock-out leads through the shank. It may be a single bar or rod, or a double rod fastened to a pad above the shank, or a single rod with an extension beneath contacting the shedder or some such other arrangement as is suitable for the particular die under consideration. Regardless of type used, the following must be observed:

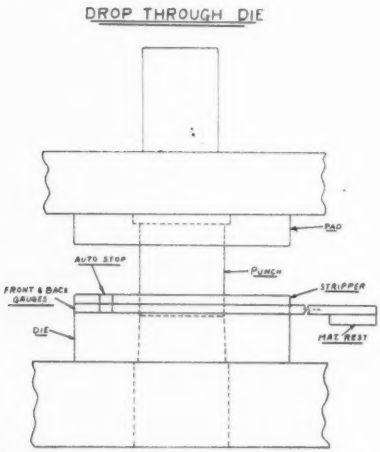
1. Adequate strength.
2. Equal distribution of striking points and provisions for proper movement or travel.

If springs are used, as in the larger dies, the knock-out is not necessary.

GAUGE PINS AND STOPS

The most commonly used type of gauge pins are of spring construction. They are properly located in the stripper and should be of the compression type for the best results. As stated previously, provisions for the spring must be made in the punch base, if it is of that type, before hardening to avoid difficulty. To prevent the pin from coming out it is always shouldered beneath the stripper, the spring contacting the shank of the pin and the front extending above the stripper surface about ¼ inch. As the die descends, the pin travels down without interference, thus permitting uninterrupted cutting and a solid die surface not weakened by clearance holes that would otherwise be necessary.

The number of gauge pins varies with the length of blank. One of the spring type in the stripper, and a solid pin beyond the die and stripper mounted into the shoe, are usually sufficient. In some instances, more guidance is required and may be obtained by a method as illustrated. These pins are used for stock gauging or guidance and determine the amount of scrap



on the sides.

Stop pins are of the same construction as the gauge pins and must be located properly to give the desired amount of scrap between blanks. However, pins are not the only method used for stops; an automatic arrangement may be made. It is identical in construction and principle to the stop used in the drop-through die with the exception that the mounting and direction of vertical travel are reversed.

As a general summary, the following points of construction are important and essential in both the compound and drop-through types of blanking dies:

1. Proper strength and thickness of die and punch.
2. Correct clearance between punch and die.
3. Proper taper in die.
4. Sufficient stripping facilities.
5. Correct gauging and stopping.
6. Spring pins in all shedders.
7. Die openings made to proper size and contour for they determine the size and shape of blank.
8. Central mounting on die set, particularly the compound die, because of the knock-out through the shank.

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New designs and shapes, more complicated mechanisms and assemblies require more specially designed *Tools, Gages, Jigs* and *Fixtures* and that all of these be precision-built.

The competition of today frequently makes lower costs mandatory and among the most important factors contributing to this accomplishment are specially designed *Machines*.

In all industrial areas are the contract shops of the Special Tool, Die & Machine Shop Industry with organizations and facilities developed to design and build these highly specialized production *Tools*. Their very existence depends upon successful competitive bidding as well as economical operation. Their competition is not only among themselves but frequently with "inside" tool rooms and die departments; thus there are established both the standards of price and workmanship.

This is just one of the important reasons why production manufacturers are invariably finding it desirable and profitable to call upon qualified shops of the Special Tool, Die & Machine Shop Industry to estimate costs of their new tooling programs.

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New Precision Profile Grinder

A PRECISION profile grinder for the highly accurate fitting of dies and punches, the finishing of templates, cams, gages and unusual shapes is announced by the Boyar-Schultz Corporation. It has been designed particularly to eliminate much of the hand finishing frequently made necessary in the precision shop and tool room.

The new machine tool is for bench use. Its light weight makes it readily portable, the motor and all moving parts, except the grinding wheel, being enclosed in a ventilated cast aluminum case.

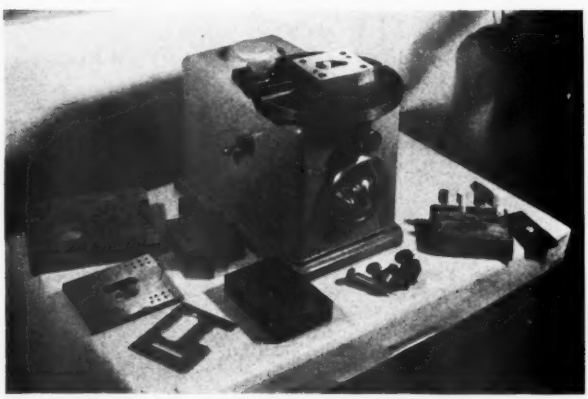
The grinder has a reciprocating spindle revolving at approximately 20,000 R.P.M. It is instantly adjustable to provide this reciprocal movement in a vertical plane. This results in greater smoothness of the ground surface as well as more even wear of the grinding wheel. The spindle is belt driven by an electric motor operating at 3,600 R.P.M.

A sine bar adjustment makes it possible to tilt the work table 5 degrees with utmost accuracy. All operating parts are below the table, therefore work in process is always completely visible and the machine itself is of a height to permit a worker to stand directly over it.

A specially designed diamond wheel dresser is furnished and every provision is made for the take-up of wear, thus assuring continuously accurate operation and long life.

Workman using the Profile Grinder stands directly over his work.

For descriptive circular TD and price write Boyar-Schultz Corporation, 2114 Walnut Street, Chicago, Illinois.



It is on such parts as these that the Profile Grinder is exceptional.

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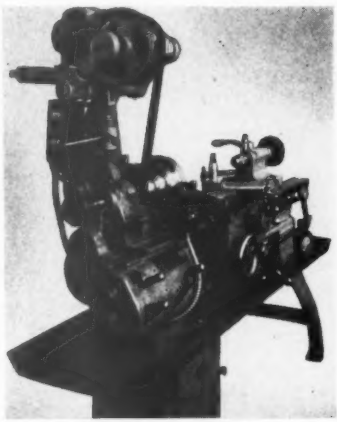

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New Multi-Pin Clutch Developed for Punch Presses

A NEW Multi-Pin Clutch on Federal Punch Presses replaces the conventional type single sliding pin and sleeve type clutches.

A greater speed is obtained by the use of multiple pins mounted in the crankshaft that engage with a like number of openings in a hardened alloy steel plate attached to the flywheel. By using a series of pins located around the crankshaft, a very minimum of space is allowed between the pins, making instantaneous action upon tripping the press.

By the use of multiple pins, the new Multi-Pin Clutch has a much greater capacity, having approximately three times that of the single pin clutch.

The power or energy from the flywheel is transmitted directly to the crankshaft since the clutch pins are mounted in a solid forging. The energy is also transmitted throughout the entire circumference of the shaft, distributing the load equally without strain on the flywheel end of the shaft.

The pins are moved in and out of engagement by a cam of alloy steel, hardened and ground. This cam is operated by contact with a shaft running horizontally toward the rear of the press, and on the contacting end of this shaft a roller is attached which reduces wear to the minimum. The other end of this shaft attaches to the tripping rod; thus, when the press is tripped the above shaft is moved horizontally toward the rear of the press and this releases the cam which forces the pins into the wheel.

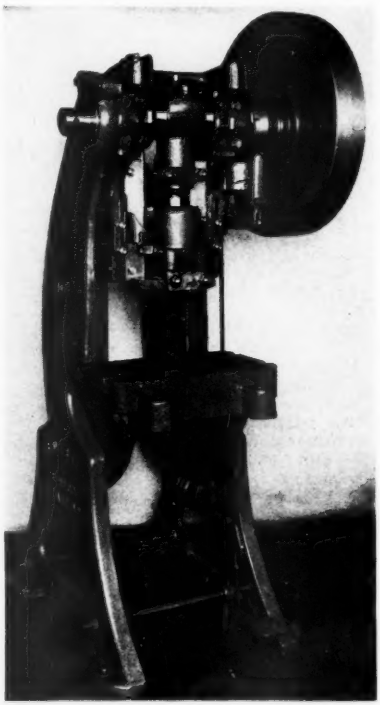
The flywheel is mounted on Timken roller bearings making the entire clutch and flywheel unit of exceptional durability. Due to the great excess capacity and general construction, dependability in operation is assured.

All parts of the new clutch are easily and economically replaced. The round clutch pins can be removed without removing the flywheel, and due to their simplicity of design, they can be economically replaced.

The flywheel facing can be easily replaced and can be furnished to allow backlash for testing dies or close fitting for continuous roll feed jobs, or where pressure pads are used, to avoid recoil. This feature is optional, and the facing may be changed at any time by removing the facing and replacing with another at a very reasonable cost. This feature is highly desirable, since some users desire the backlash and some do not, and with the Multi-Pin flywheel facing, it is optional, and can be changed at any time after purchase by obtaining an additional facing at a nominal cost.

Incorporated in the clutch is a simple positive built-in single stroke tripping mechanism, which is positive and easily engaged or disengaged for single or continuous operation with one finger from the front of the press.

(Continued on page 42)



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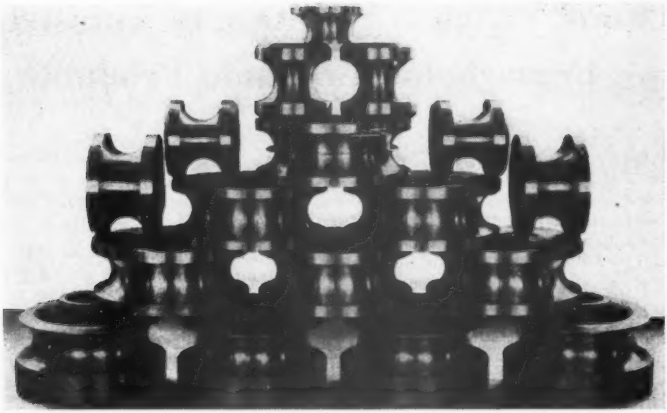

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Your watch is quite a traveler even though you may not go far from home in a year—its balance staff covers some 4,000 miles annually. It ticks 432,000 times a day or 157,680,000 times a year.

In spite of the fact that a watch has mechanism many times finer than an automobile, a watch maker will tell you that you frequently forget to have it serviced for months and even years at a time. You regularly change the oil in your motor car but how often do you change the oil in your watch and this in spite of the fact that three of its wheels make more than 5,000,000 revolutions every year.

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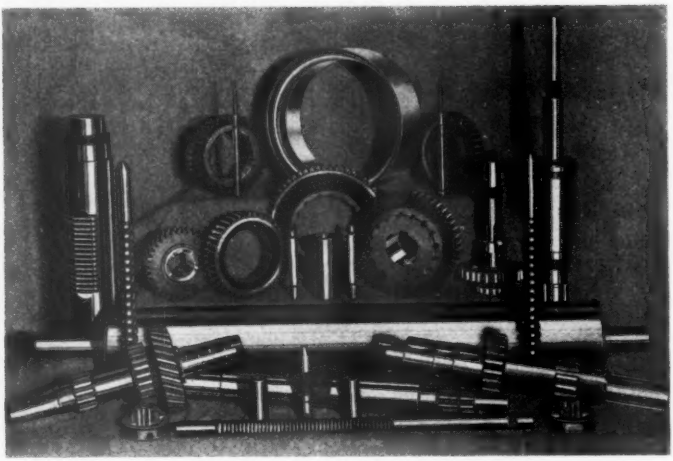

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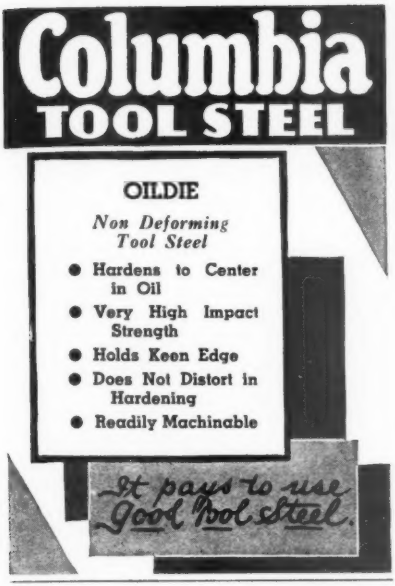

Flame Hardening

(Continued from page 21)

inserted way strips which are bolted on or dovetailed to the main bed section. Tests have proven that there is no tendency of "Flame Hardened" portions to crack or flake even under abuse, such tests having taken the form of subjecting the bed sections to flexing under hydraulic press pressure without injury. The depth of the hardened portion minimizes the probability of injury to the way surface which generally results when a chuck or work piece is dropped on it. The way surfaces of these hardened beds are ground to a tolerance of .0005" in their overall length.

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The Catalog Review

Brief descriptions of current industrial literature including technical booklets and bulletins, catalogs and circulars. All may be had upon request, without charge. . . . Please use identification numbers.

UTILITY GRINDER.—Circular describes this general purpose tool for grinding centers, reamers, cutters, dies, rolls, bushings and for surface grinding on shapers and planers. Fourteen types with motors ranging in horsepower from ¼ to 1 are described as to specifications. Particular stress is put upon its grinding power above its rating. Write the F. A. Maxwell Company, 310 Broadway, Bedford, Ohio, for TD-201.

THREAD PLUG GAGES.—A circular describing three-way savings on Crobalt Thread Plug Gages recently developed. The longer wearing properties of Crobalt are cited and various types of gages described. Write T·D·M PROGRESS, 215 Fairmount-Cedar Building, Cleveland, Ohio, for TD-202.

GRINDING WHEELS.—A catalog of the Safety Grinding Wheel & Machine Company which is described as "being an earnest effort to enliven a staid subject and to enhance the value of the book as a reference work." One chapter describes grits, grains, bonds and grades, another types of wheels and sizes, a third accessories. Under the chapter titled "Suggestions," ways and means of cutting grinding costs are dealt with. Write T·D·M PROGRESS, 215 Fairmount-Cedar Building, Cleveland, Ohio, for TD-203.

PORTABLE ELEVATING TABLE.—An excellent folder illustrating the Hamilton portable elevating table in actual use. Describes graphically the ease with which heavy dies, jigs, machine parts and other products weighing from 1 to 2½ tons can be handled and transported by one man. Shows table in use for supporting, leveling and loading large work on jigborers, horizontal mills and punch presses. Write the Hamilton Tool Company, 222 North B Street, Hamilton, Ohio, for TD-204.

HARD CHROME PLATING.—A chromium plated title page distinguishes this well illustrated booklet describing the process of hard chrome plating as applied to machine parts and dies and its development in the industrial field. Its history, physical properties, present uses, new uses being developed and its desirability for tool salvaging are explained. Typical uses include the plating of tools, dies, molds, gages, cams, gears and other precision parts. A standard scale for hard chrome plating is also included. Write The Master Chrome Service, Inc., 5611 Herman Avenue, N.W., Cleveland, Ohio, for TD-205.

DIE MAKING MACHINES.—Under the title "Ten Years Of Manufacturing Progress" Grob Brothers describe their open end line of metal band saw and continuous motion die filing machines. Contains numerous illustrations and complete specifications of the open end band saw as well as the continuous type. Write Grob Brothers, Grafton, Wisconsin, for TD-206.

GAGES AND BURNISHING TOOLS.—Practical pocket handbook prepared to serve two distinct purposes. The first section is designed, not as a catalog, but as a concise description of the facilities and capacities of the Lincoln Park Tool & Gage Company. Typical views of the various departments include the recently installed, modern hard chrome-plating equipment said to be unsurpassed in the gage industry. The second section is devoted entirely to data on gage standards as compiled by the American Gage Design Committee. A comprehensive treatise for all gage users. Write the Lincoln Park Tool & Gage Company, 1721 Ferris Avenue, Lincoln Park, Michigan, for TD-207.

END MILLS AND HOLDERS.—A complete catalog of single and double end, end mills and end mill holders. Illustrations, detailed drawings with dimensions, and speed tables are included. Descriptive material explains the necessity for the elimination of chatter, uniform cutting action, adequate chip clearance, proper tool clearance, and a rigidly held mill which permits working to close limits in order to obtain the highest degree of accuracy at speeds and feeds much higher than those set up by the limitations of usual practice. A jigborer end mill set consisting of 21 mills ranging from ⅛" to 1" and several tool room sets are illustrated and described. Write The Weldon Tool Company, 3000 Woodhill Road, Cleveland, Ohio, for TD-208.

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END MILLS, COUNTERBORES AND REAMERS.—A handy 32-page catalog for users of standard and special cutting tools including two and four flute, spiral cut and two lipped single and double end, end mills and end mill holders. Putnam Hi-Speed fast-spiral solid counterbores designed with extra long flutes and plenty of chip clearance insuring greater length of cutting life are described. Hi-Speed spiral fluted chucking reamers with straight and taper shanks are also included. Complete specification tables are given. Write The Putnam Tool Company, 2985 Charlevoix Avenue, Detroit, Michigan, for TD-212.

COMPOSITE DIE SECTIONS.—A letter file folder which may be placed directly in the file drawer to receive all descriptive matter and correspondence with this firm. Describes electrically butt welded die sections of several standard types and details methods to be followed when ordering. Prices per pound and lineal inch for several kinds of tool steel are quoted. Write the Ajax Steel and Forge Company, 207 Adair Street, Detroit, Michigan, for TD-213.

SHAPERS.—An effective illustrated catalog of Cincinnati Shapers. The four types, Rapid Traverse, Universal, Railroad, and Utility, which are built in twenty-two models and ten sizes, are described in complete detail. The many important details of construction such as the internal transmission, feeding motion, length of stroke, "V" type ram, solid tool slide, one piece crank gear, etc., are carefully explained. Dimension and specification charts are included. Write T·D·M PROGRESS, 215 Fairmount-Cedar Building, Cleveland, Ohio, for TD-214.

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This instrument, the only one of its kind in existence, brings millionth-of-an-inch precision out of the laboratory and into the production line.

The unprecedented speed and accuracy of the device, which measures units so small 3,000 of them would be required to equal the size of a human hair, is arousing wide interest among scientists.

While the profilometer now is being used to check the smoothness of safety glass used in Ford V-8 cars and trucks, company engineers believe it can be used to insure almost unbelievable accuracy in scores of other manufacturing processes.

"Measurements of one-millionth of an inch are commonplace in the Ford laboratories," the technician in charge of the new instrument said, "but they must be made under carefully controlled conditions.

"The profilometer is the first device ever invented which permits the same degree of accuracy in the plant itself. Obviously, it has possibilities of enormous importance to both science and industry."

The instrument operates on some of the principles used in radio, and is not impressive in appearance. It consists of a small metal box attached by a five-wired electric cable to an amplifying cabinet. There is a dial on top the small metal box, and a diamond-tipped needle in the bottom.

As the box is pushed across the surface to be measured, the needle follows the invisible contours in it. This causes variations in the electric current, which are amplified in the larger cabinet, and returned to the dial, where an instantaneous reading appears in terms of millionths of an inch.

The machine is simple to operate, and by watching the flickering of the needle closely the operator obtains a measure-

(Continued on page 39)

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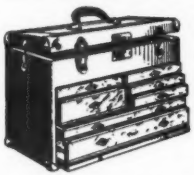

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GERSTNER TOOL CHESTS
56 Columbia St., Dayton, Ohio

Millionths Measured in Ford Glass Plant

(Continued from page 38)

ment of the average smoothness of the surface, as well as of the extreme depths of any pits that may be present.

"In glass making, any unusual roughness in the surface, after the plates pass under the grinders and polishers, indicates the possibility of an inaccurate mix or of an improper grade of sand in the grinders," the technician said. "The profilometer, used at regular intervals, enables us to detect increasing roughness and to remedy it before it reaches the maximum permissible.

"In this way we are able to prevent waste and to insure a high degree of uniformity in the finished product. The profilometer enables us to take still another step on the long road that has been travelled in recent years in transforming glass making from a hit or miss, rule of the thumb business to an exact science."

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Ulmer Co., The J. C., 1791 East 38th St., Cleveland, Ohio.
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Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Holo-Krome Screw Corp., The, Hartford, Conn.
Strong, Carlisle & Hammond Co., 1392 West Third St., Cleveland, Ohio.
SHEARS—Bolt & Rivet—Automatic
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.
SPRINGS—Die
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
STAMPINGS
Barth Stamping & Mach. Works, W. 34th & Denison, Cleveland, Ohio.
Boehm Pressed Steel Co., The, 2225 West 63rd St., Cleveland, Ohio.
Davis Tool & Engineering Co., 6481 Epworth Blvd., Detroit, Mich.
Denning Mfg. Co., The, 1775-81 E. 87th St., Rockford, Ill.
Detroit Stamping Co., 3443 West Fort St., Detroit, Mich.
Modern Tool & Die Co., P. O. Box 2741, Cleveland, Ohio.
Rockford Die & Tool Wks., Inc., 1816 Seventeenth St., Rockford, Ill.
Star Machine & Tool Co., 9320 Woodland Ave., Cleveland, Ohio.
Star Tool & Die Works, 2522 24th St., Detroit, Mich.
Ulmer Co., The J. C., 1791 East 38th
Variety Machine & Stamping Co., The, 12695 Elmwood Ave., Cleveland, Ohio.
St., Cleveland, Ohio.
STEEL—Alloy
Columbia Tool Steel Co., 410 East 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1258-64 West Fourth Street, Cleveland, Ohio.
Wheelock-Lovejoy & Co., Inc., 5205 Hamilton Ave., Cleveland, Ohio.
STEEL—Carbon
Columbia Tool Steel Co., 410 East 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1258-64 West Fourth Street, Cleveland, Ohio.
STEEL—Chromium
Darwin & Milner, Inc., 1260 West Fourth St., Cleveland, Ohio.
STEEL—High Speed
Ajax Steel & Forge Co., 17225 Newbern Ave., Detroit, Mich.
Columbia Tool Steel Co., 410 East 14th Street, Chicago Heights, Ill.
Darwin & Milner, Inc., 1260 West Fourth St., Cleveland, Ohio.
STEEL—Stainless
Ajax Steel & Forge Co., 17225 Newbern Ave., Detroit, Mich.
STEEL—Tool & Die
Columbia Tool Steel Co., 410 E. 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1260 West Fourth St., Cleveland, Ohio.
STEEL TREATING—Hardening
Porter Steel Treating Co., The Geo. H., 1225 Marquette St., Cleveland, Ohio.
STRAIGHTENING MACHINES
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.
TAPPING MACHINES
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.
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Lyons Machine Co., 5601 Tillman Ave., Cleveland, Ohio.
TOOL CHESTS
Gerstner Tool Chests, 56 Columbia St., Dayton, Ohio.
TOOL HEAD—Universal
Precision Tool Co., The, Bridgeport, Conn.
TOOL HOLDERS
Weldon Tool Co., The, 3000 Woodhill Rd., Cleveland, Ohio.
TUBING—Tool Steel
Bissett Steel Co., The, 947 E. 67th St., Cleveland, Ohio.
VENTILATING APPARATUS
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.
WELDING
Overly-Hautz Co., 1621 West 116th St., Cleveland, Ohio.
Star Tool & Die Works, 2522 24th St., Detroit, Mich.

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Small and Medium

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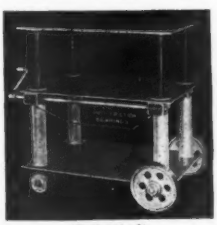
Move heavy dies, jigs and fixtures more quickly, economically and safely *with the*

HAMILTON PORTABLE ELEVATING TABLE



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Eliminates costly mishaps and breakage . . . Is a labor saver because it requires only one man to handle . . . Levels and supports overhanging pieces of work . . . Safe—Indispensable—Inexpensive . . . Two Sizes: 2,000 pounds and 5,000 pounds.

Write for circular and prices

THE HAMILTON TOOL COMPANY

222 North B Street Hamilton, Ohio

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The 1938 Porter Baseball Calendar is ready. Drop a line to The George H. Porter Steel Treating Company, 1221 Marquette Street, Cleveland, Ohio, or telephone HEnderson 6601 and mention T·D·M PROGRESS. It's your's for the asking.

Multi-Pin Clutch

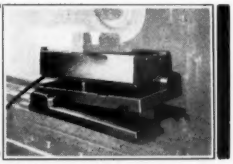
(Continued from page 32)

Another feature is a safety device which, in the event the foot pedal is depressed, will hold the clutch out of operation, making it impossible for the clutch to engage with the flywheel while setting dies.

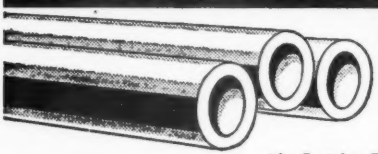
Complete information about this Multi-Pin Clutch and its incorporation in the Federal line of open back inclinable punch presses may be obtained upon request to Department TD, The Federal Press Company, Elkhart, Indiana.

Saves Hours of Set-up Time
•
Accurate to Precision Limits

The MAGNA-SINE
A Magnetic Sine Table Adjustable to ANY DESIRED GRINDING POSITION
ROBBINS ENGINEERING CO.
637 Mt. Elliott Ave. Detroit, Mich.



OIL HARDENING TOOL STEEL TUBING



Substantially reduces labor costs by eliminating the expensive procedure of drilling from the solid.
BISCO TOOL STEEL TUBING is a fine grade tool steel in tubular form available in sizes up to 14" diameter and 2" wall thickness; other sizes to your specification.
THE BISSETT STEEL COMPANY
947 E. 67th St. Cleveland, Ohio
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Also Stainless Tubes, Mechanical Tubes, Aircraft Tubes, Pressure Tubes

THE GEO. H. PORTER STEEL TREATING CO.
Tool Work Our Specialty
• *Heat Treating*
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A telephone call or postal card will bring our new 1938 Baseball Calendar

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Exclusive Sales and Service Representatives for:
GROB Metal Bandsaws and Chain Filing Machines (page 6)
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HAVE YOUR DIES WELDED
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- Welding of Jigs and Fixtures
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ALL DIE WELDING DONE WITH STEEL OF SAME ANALYSIS AS YOUR DIE

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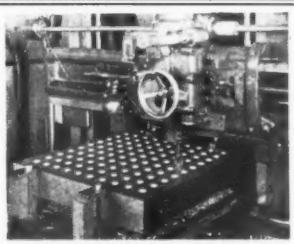
WANTED
Designer of Drilling and Tapping Machines.
Should be thoroughly experienced in designing such equipment for large work of the more complicated type. State experience, where now employed and how soon available. Replies held confidential. Address Box B, % Tool-Die-Machine PROGRESS, Fairmount-Cedar Building, Cleveland, O.



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PROGRESSIVE DIE RETAINER PLATES

- This set of Hovis Retainer Plates, Punches and Button Dies was made for the interchangeable manufacture of several different sizes of paper washers — .004 inch thick. All punches are .0005 inch smaller than the buttons.

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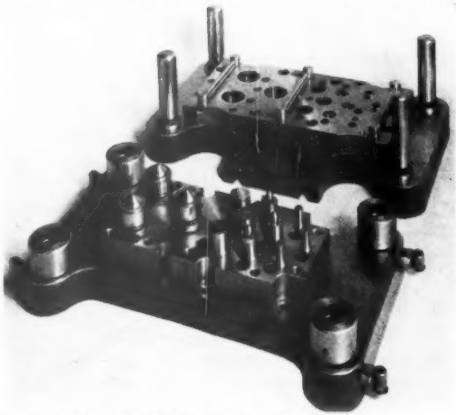
We are doing unusual things with Hovis Screwlock Retainers right along. What can we do for you?



WRITE FOR CATALOG AND INTERESTING DATA

HOVIS SCREWLOCK COMPANY
3129 LARNED ST., E. DETROIT, MICH.
Representatives
Pennsylvania, New Jersey, Maryland: Edward R. Glenn, 1438 N. 13th St., Philadelphia, Pa.
Wisconsin: Lee Eckelman, 4417 W. North Ave., Milwaukee, Wis.

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BARTH STAMPING & MACH. WORKS
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GLENN A. BARTH THOM. A. BARTH
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***THE BUNELL MACHINE & TOOL CO.**
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JIGS—FIXTURES—GAGES—MODELS
Blanking, Forming, Drawing, Piercing
Trimming, Bending and Coining Dies
Special Tools and Machinery

CLEVELAND UNIVERSAL JIG COMPANY
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Modern equipped shop for building of
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Equipment includes:
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SHEET METAL DIES, TOOLS, SPECIAL MACHINERY, DIE CASTING DIES, RUBBER MOULDS
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Modern Facilities
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PLANERS
42 in. by 14 ft. Long
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*See larger display advertisement also.

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DIES - JIGS - FIXTURES
Special Machines
JIG BORING with
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NEW OPENSIDE PLANER EQUIPMENT
12 ft. x 48" Capacity

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"Let us be your tool room."
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Special Machinery *Designing and Building*
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DIES, METAL STAMPINGS
250 tons capacity

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***THE INTERNATIONAL TOOL CO.**
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Dies, Jigs, Fixtures, Gages
Special Machinery, Machine Work, Designing

Hamilton, Ohio

***THE HAMILTON TOOL COMPANY**
220-222 North B Street
Designers and Builders of
Tools, Dies, Jigs, Fixtures, Special Mach'y
The Hamilton Portable Elevating Table

*See larger display advertisement also.

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Manufacturers of
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Motor Drives, Gears, Worms, Tools, Fixtures
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Specialists in the Designing and Building
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Dies—Tools—Special Machinery

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Special Machinery and Experimental Work

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STAR TOOL & DIE WORKS
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BUILDERS of DIES
Facilities for the Largest
MANUFACTURERS
of STAMPINGS

*See larger display advertisement also.

When you order or write about products described in TDM PROGRESS please mention the publication.

New Gear Finishing Machine

A NEW low cost gear finisher was recently designed by the Michigan Tool Company for use wherever production is limited or a wide variety of gear finishing on one machine is necessary.

It is a single rotary cutter and operates on the crossed-axis principle. The cutter and gear rotate in mesh about different axes, so that a sliding action diagonally across the face of the gear tooth is produced as they rotate. As a result of this action excess material is "shaved" off by the serrations on both sides of the cutter teeth faces.

After the gear is loaded into the machine on arbors or between centers and the control button pushed, the cutter begins to rotate, driving the gear with it. While the cutter revolves, the table carrying the cutter moves away from the operator toward the rear of the machine until the point has been passed by the cutter where center distances between cutter and gear reach the minimum. At this point the feed of the table automatically reverses, carrying the cutter back through maximum depth of contact with the gear. After this complete cycle, the machine automatically stops for re-loading.

The cutter teeth are notched in such a manner that the same cutting action results on both sides of the land between the serrations. This method of cutting is important, since it not only prevents burnishing or cold working of the metal on the surface of the teeth being finished, but at the same time provides a free cutting tool.

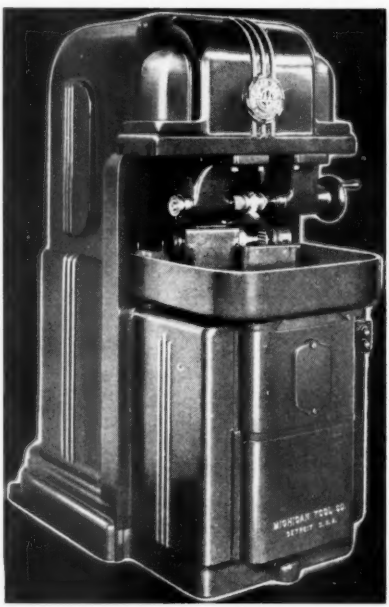
To set up the machine, the table is set at the required center distance and locked while all gears of the same diameter are finished. It is a simple matter to set or re-set the machine to duplicate the exact lead desired by means of a sine-bar setting for the cutter spindle, and a scale and vernier reading to five minutes. Adjustment of table travel feed is by change gears, while the distance of the table travel is adjustable by electric controls for the automatic cycle. The swivel mounting of the cutter head allows either right or left hand gears to be finished.

The cutter is mounted on the table so as to eliminate the spring or deflection accompanying overhanging unsupported spindles and reciprocating parts, removing one of the frequent causes of inaccuracies in gear finishing. The illustration shows how the machine and cutter are designed so that only a very short table-travel stroke is required, assuring machine rigidity—vital for accurate gear finishing.

The precision type ball and roller bearings sealed against dirt and cutting oil, fan cooled motor mounted within the base for protection from dirt, and spiral bevel drive gears for the cutter spindle running in grease, contribute to the long life designed into this new gear finishing machine.

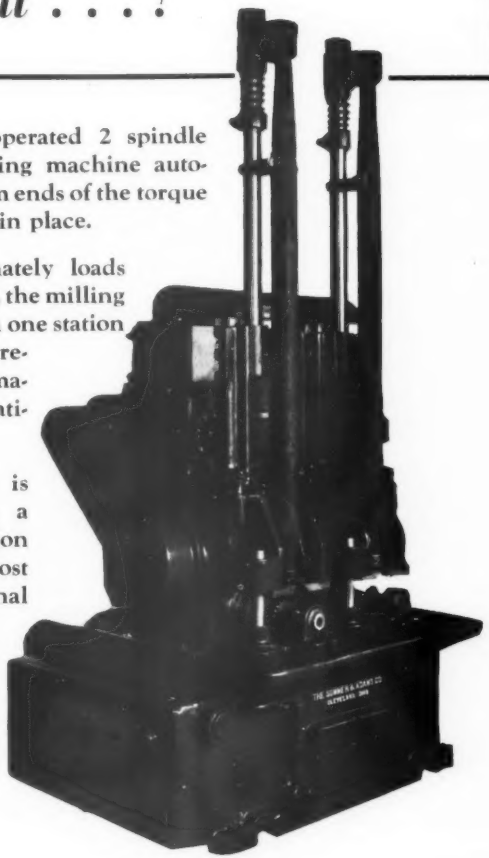
The machine is available for finishing gears of 8″ or 12″ diameters. It is driven by a 3 HP, 1200 RPM electric motor designed into the machine but accessible and provided with ample cooling.

Write Michigan Tool Company, 7171 E. McNichols Ave., Detroit, Michigan, for Circular TD.



WE DESIGNED, DEVELOPED

and Built it . . . !



• This hydraulically operated 2 spindle "plunge-cut type" milling machine automatically slots the bottom ends of the torque tubes which are shown in place.

A single operator alternately loads and unloads the fixtures, the milling operation being done on one station while the other is being reloaded; otherwise the machine operates automatically.

This special machine is adaptable for milling a large variety of production parts at much lower cost than with the conventional method.

•

Let us furnish you with production details and prices.

•

THE SOMMER & ADAMS COMPANY

18511 Euclid Avenue — Cleveland, Ohio

TOOLS - JIGS - FIXTURES - GAGES

Automatic Machines for Continuous Milling, Drilling, Polishing and Buffing

REPRESENTATIVES

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NOW IS THE TIME...!

When production has eased off, that's the time to overhaul production machines—to renew and modernize. We can do it most economically in our *NEW PLANT*, with our *New Equipment*, by our *Factory Methods*. We have the repair parts in stock.

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"The Next Time You Buy"

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200% TO 500% LONGER LIFE